



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/595,333

01/26/2007

Yiquan Yang

032301.452

7657

25461 7590 04/24/2008

SMITH, GAMBRELL & RUSSELL  
SUITE 3100, PROMENADE II  
1230 PEACHTREE STREET, N.E.  
ATLANTA, GA 30309-3592

EXAMINER

LAO, MARIALOUIA

ART UNIT

PAPER NUMBER

1621

MAIL DATE

DELIVERY MODE

04/24/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/595,333	<b>Applicant(s)</b> YANG ET AL.	
	<b>Examiner</b> LOUISA LAO	<b>Art Unit</b> 1621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 February 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-13, 16, 18-28 and 30-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13, 16, 18-28 and 30-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments, filed 2/15/08, with respect to the
  - a. objection of claims 10 and 12 ; and claim 29, in light of the amendments have been fully considered. Therefore, the objection has been withdrawn.
  - b. rejection(s) of claim(s) 6, 22 and 23, 26, 9 and 31 under 35 U.S.C. 112, 2<sup>nd</sup> ¶ have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.
  - c. rejection of claims 1-32 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

Also, upon further consideration, a new ground(s) of rejection is made, see below.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1-4, 13, 16, 17 and 27 are rejected under 35 U.S.C. 102(b) or 102(a)\* as being anticipated by Wang et al. Xiamen Daxue Xuebao, Ziran Kexueban (2003), 42 (1), 64-68 *in IDS*.

(\* (a) or (b) depending on the actual publication date of Wang et al.)

4. Applicants' claims are drawn to a continuous process for the manufacture of methylmercaptan comprising *inter alia* contacting in a reaction a mixture of carbon oxides,

Art Unit: 1621

sulfur or hydrogen sulfide and hydrogen in the presence of a catalyst comprising an active component of Mo-O-K-based species (oxides of molybdenum), an active promoter (mixture of oxides or sulfides or sulfides and oxides) and, optionally, a carrier (silica).

5. Wang et al. teach a process for synthesizing methanethiol from H<sub>2</sub>S-containing syngas using a Mo-O-K based catalyst on SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, activated carbon or CNTs in the presence of a promoter, like CoO, NiO or Fe<sub>2</sub>O<sub>3</sub>. The weight ratio of the catalyst to carrier is 5:20, for example; and the weight ratio of catalyst to CoO to SiO<sub>2</sub> is 5:1:20.

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

6. Claims 1-4, 13, 16, 17 and 27 are rejected under 35 U.S.C. 102(a) as being anticipated by Yiquan et al. (CN1528516, CN`516 *in IDS*).

7. Applicants' claims are drawn to a continuous process for the manufacture of methylmercaptan comprising *inter alia* contacting in a reaction a mixture of carbon oxides, sulfur or hydrogen sulfide and hydrogen in the presence of a catalyst comprising an active component of Mo-O-K-based species (oxides of molybdenum), an active promoter (mixture of oxides or sulfides or sulfides and oxides) and, optionally, a carrier (silica).

8. CN`516 teaches “ the use of synthetical [*sic*] gas containing high concentration H<sub>2</sub>S as raw material to synthesize methanethiol by one-step method, composed of carrier, active component and active accelerant, where the carrier selects SiO<sub>2</sub>, TiO<sub>2</sub> or heavy rare earth oxide; the active component is Mo-O-K based compound, converted by the fore [*sic*] body K<sub>2</sub>MoO<sub>4</sub> or (NH<sub>4</sub>)<sub>6</sub>Mo<sub>7</sub>O<sub>24</sub> plus sylvine [*sic*] or MoO<sub>3</sub> plus sylvine [*sic*]; the active accelerant is mainly transition metal like Mn, Fe, Co, Ni, Ce, La, etc, or rare earth oxide; it makes catalysis reaction

Art Unit: 1621

at 295 deg.C and 0.2 Mpa in the volume ratio of the raw material gases CL [sic]/H<sub>2</sub>/H<sub>2</sub>S=1/2/(0.1-1) at an airspeed of (1-5) x ten to the power 3 h<sup>-1</sup>, showing high activity and selectivity, the methanethiol's time-space catching rate is up to 0.18-0.25g.h<sup>-1</sup>. ml<sup>-1</sup>cat, and the methanethiol's selectivity is 93. 5%-98.8%.” (see English abstract).

Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

9. A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 1-4, 13, 16, 17 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Yang et al. Catalysis Letters (2001), 74(3-4), 221-225 *in IDS*.

11. Applicants' claims are drawn to a continuous process for the manufacture of methylmercaptan comprising *inter alia* contacting in a reaction a mixture of carbon oxides, sulfur or hydrogen sulfide and hydrogen in the presence of a catalyst comprising an active component of Mo-O-K-based species (oxides of molybdenum), an active promoter (mixture of oxides or sulfides or sulfides and oxides) and, optionally, a carrier (silica).

12. Yang et al. teach the catalytic reaction for methanethiol synthesis in the presence of prepared catalysts and the preparation of said catalysts(section 2.1 page 221), K<sub>2</sub>MoO<sub>4</sub>/SiO<sub>2</sub> and MoO<sub>3</sub>/K<sub>2</sub>CO<sub>3</sub>/SiO<sub>2</sub> (from (NH<sub>4</sub>)<sub>6</sub>Mo<sub>7</sub>O<sub>24</sub>.4H<sub>2</sub>O) from high H<sub>2</sub>S-containing syngas at reaction conditions of 295°C, GHSV=3000h<sup>-1</sup>, V(CO):V(H<sub>2</sub>):V(H<sub>2</sub>S)=2:7:1 and reaction products are hydrocarbon and mercaptan (page 221 column 2). Yang et al. teaches in Tables 1 and 2, the results of the methanethiol synthesis with the selectivities to be as high as 99%. Yang et al. teaches that MoO<sub>3</sub>/K<sub>2</sub>CO<sub>3</sub>/SiO<sub>2</sub> (5/3/20) has a high catalytic activity (column 1 page 224).

Art Unit: 1621

13. The instant claims are anticipated.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

14. Claims 5-12, 18-26, 28 and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. Xiamen Daxue Xuebao, Ziran Kexueban (2003), 42 (1), 64-68 *in IDS* or Yiquan et al. (CN1528516, CN'516 *in IDS*) or Yang et al. Catalysis Letters (2001), 74(3-4), 221-225 *in IDS*, as applied to claims 1-4, 13, 16, 17 and 27, in view of Buchholz (GB2016468, GB'468 *in IDS*).

15. Claims rejected under Wang et al. or CN1516 or Yang et al. as discussed *supra* are set forth herein in their entirety.

16. Applicants' claims are drawn to a continuous process for the manufacture of methylmercaptan comprising *inter alia* contacting in a reaction a mixture of carbon oxides,

Art Unit: 1621

sulfur or hydrogen sulfide and hydrogen in the presence of a catalyst comprising an active component of Mo-O-K-based species (oxides of molybdenum), an active promoter (mixture of oxides or sulfides or sulfides and oxides) and, optionally, a carrier (silica). The by-products are separated from the unused reactants; where the both are catalytically converted, prior to re-use, to carbon oxides hydrogen and hydrogen sulfide.

17. Applicants' claims differ from Wang et al. or CN'516 or Yang et al. in that the instant claims recite a) the catalyst is extruded or pelletized to a 3-dimensional form, b) that the unreacted materials are separated from the by-products, whereupon both, after catalytically being converted, are re-used, that the catalysts may be arranged in fixed beds and c) the recitation of by-products.

18. GB'468 teaches the manufacture of methyl mercaptan, as a well-known art, since methyl mercaptan is widely used as a commercial intermediate (page 1 ll1-5 and 15-19). GB'216 teaches typical reaction conditions, typical catalyst supports, including the recovery of unconverted reactants from the desired products (p2 ll1-55). GB'468 illustrates the methylmercaptan production with working examples (Examples 1-7).

19. At the time of Applicants' invention, one of ordinary skill in the art looking for a methylmercaptan synthesis, would have found it obvious to start with the teachings of Wang et al. or CN'516 or Yang et al. since the cited prior art references teach the methanethiol synthesis in the presence of catalysts with promoters as in the instant process.

20. The artisan would have been motivated to utilize the methyl mercaptan methods of manufacture of Wang et al. or CN'516 or Yang et al. and couple these with the catalyst preparations as taught by Yang et al. and the well known art parameters disclosed by GB'468

Art Unit: 1621

for the advantages of process optimization, and raw material costs savings with recovery and reuse of unreacted materials; and expect a reasonable expectation of producing methanethiol from a bench to a large-scale process, optimizing the steps thereto.

21. Absent a showing of criticality and unexpected beneficial results, the form of the catalyst as pellets or extrudates (as in claim 6, for example); weight ratios (as in claim 16, for example), the temperature ranges (as in claims 10 or 11 for example), the recycling of unused materials (as in claim 7, for example) are optimization techniques that are within the purview of the artisan in his normal endeavor, without inordinate degree of experimentation. The claim would have been obvious because “a person of ordinary skill has a good reason to pursue the known options within his or her technical grasp”, especially in defraying capital costs and reusing unreacted materials. If this leads to the anticipated success, it is likely the product, not of innovation, but of ordinary skill and common sense.

Optimizing such processes is *prima facie* obvious because an ordinary artisan would be motivated to use known processes from the art to make the process more efficient or explore economical advantages over the other. Merely modifying the process conditions is not a patentable modification absent a showing of criticality. In re Aller, 220 F.2d 454, 105 U.S.P.Q. 233 (C.C.P.A. 1955).

22. No claims are allowed.

### ***Conclusion***

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References cited in WO2005040082.

### ***Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MLouisa Lao whose telephone number is 571-272-9930. The examiner can normally be reached on Mondays to Thursdays from 8:00am to 8:00pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yvonne Eyler can be reached on 571-272-0871. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more



Application/Control Number: 10/595,333

Page 8

Art Unit: 1621

information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

04212008mll

Louisa Lao

Examiner

Art Unit 1621

/Porfirio Nazario-Gonzalez/  
Primary Examiner, Art Unit 1621